

NAG Toolbox for MATLAB

e01rb

1 Purpose

e01rb evaluates continued fractions of the form produced by e01ra.

2 Syntax

```
[f, ifail] = e01rb(a, u, x, 'm', m)
```

3 Description

e01rb evaluates the continued fraction

$$R(x) = a_1 + R_m(x)$$

where

$$R_i(x) = \frac{a_{m-i+2}(x - u_{m-i+1})}{1 + R_{i-1}(x)}, \quad \text{for } i = m, m-1, \dots, 2.$$

and

$$R_1(x) = 0$$

for a prescribed value of x . e01rb is intended to be used to evaluate the continued fraction representation (of an interpolatory rational function) produced by e01ra.

4 References

Graves–Morris P R and Hopkins T R 1981 Reliable rational interpolation *Numer. Math.* **36** 111–128

5 Parameters

5.1 Compulsory Input Parameters

- 1: **a(m) – double array**
a(j) must be set to the value of the parameter a_j in the continued fraction, for $j = 1, 2, \dots, m$.
- 2: **u(m) – double array**
u(j) must be set to the value of the parameter u_j in the continued fraction, for $j = 1, 2, \dots, m-1$.
 (The element **u(m)** is not used).
- 3: **x – double scalar**
 The value of x at which the continued fraction is to be evaluated.

5.2 Optional Input Parameters

- 1: **m – int32 scalar**
Default: The dimension of the arrays **a**, **u**. (An error is raised if these dimensions are not equal.)
m, the number of terms in the continued fraction.
Constraint: **m** ≥ 1 .

5.3 Input Parameters Omitted from the MATLAB Interface

None.

5.4 Output Parameters

1: **f** – double scalar

The value of the continued fraction corresponding to the value of x .

2: **ifail** – int32 scalar

0 unless the function detects an error (see Section 6).

6 Error Indicators and Warnings

Errors or warnings detected by the function:

ifail = 1

The value of x corresponds to a pole of $R(x)$ or is so close that an overflow is likely to ensue.

7 Accuracy

See Section 7 of the document for e01ra.

8 Further Comments

The time taken by e01rb is approximately proportional to m .

9 Example

```
a = [4;  
      1;  
      0.75;  
      -1];  
u = [0;  
      3;  
      1;  
      -0.8432846096693412];  
x = 6;  
[f, ifail] = e01rb(a, u, x)
```

```
f =  
    17.7143  
ifail =  
        0
```